

COURSE: Prescribed Fire Planning and Implementation

TOPIC: Smoke Management (Unit 5a)

LESSON A: Legislative and Legal Considerations

I. Objectives:

- A. Define Smoke Management
- B. Describe smoke as a pollutant and its potential health and safety effects.
- C. List the 2 criteria pollutants found in smoke.
- D. Describe the present legal requirements for managing smoke from prescribed fire.
- E. Describe the need for involvement in the regulatory process.
- F. Identify the components of a smoke management program .

II. Smoke Management - Definition

Smoke management is defined as managing a fire event under fuel moisture and meteorological conditions, and with firing techniques that keep smoke impacts to the environment within acceptable limits.

III. Smoke as an Air Pollutant

- A. Smoke from prescribed fire includes:
  - 1. What you can see - soot, tar droplets, water droplets
  - 2. What you cannot see - gases, organic vapors
- B. Smoke's primary products include carbon dioxide, water vapor, carbon monoxide, particulate matter, hydrocarbons (300+), other organics, and nitrogen oxides, trace materials.

#### IV Criteria Pollutants and Prescribed Burns

- A. Presently there are two criteria pollutants of concern from prescribed burning. Ambient air quality standards for these pollutants were developed to protect the public.
1. CO - because of potential health problems to fire fighters
  2. PM - because of potential health problems to fire fighters and the public and because of impacts on visibility from the standpoint of both safety and aesthetics.
- B. **Carbon Monoxide** (CO) is a gas by-product resulting from incomplete combustion of forest fuels.
1. How it affects human health Carboxyhemoglobin COHb:  
Carbon monoxide attaches to hemoglobin in the blood and acts upon the nervous system and the heart.
  2. Effects of CO on fire fighters
    - more pronounced at higher altitudes
    - smokers may have 7-8% COHb already
    - equipment operators may be doubly exposed (fire and equipment)
- C. CO exposure management for firefighters
- Whenever possible, hazards should be managed or engineered out of the work environment.
1. Highest concentrations likely to be:
    - near or immediately above active combustion zone
    - heavy concentrations of smoke  
inversions  
downwind
    - Few samples of air from wildfire/RX burning have exceeded OSHA permissible exposure limits (PEL).
    - OSHA PEL's based on normal 8 hour day/40 hour week exposure. Firefighter exposure intermittent and seasonal.
  2. Monitor if you think there is a problem. Personal exposure monitors usually work for one compound and are subject to interference from other compounds. However, most air toxics are emitted in a constant ratio to CO including respirable particulates and formaldehyde.

- Dosimeters (1) provide only cumulative data; (2) are inexpensive and light , and (3) on site data
  - CO Badges
  - Dosimeters/diffusion tubes
- Data loggers provide (1) real-time data; (2) TWA peak; and (3) computer storage of data; they are also (4) light-weight; (5) expensive; and (6) correlate well with pack sampling.
  - Carbon monoxide Data Logger (e.g. National Draeger Inc.)
  - TEOM Sampler (PM-10)

### 3. Protective devices

#### Respirators

- NIOSH does not currently approve an air purifying respirator for use during occupational exposure to fire that provides protection from the known health hazards in forest fire smoke (CO, respirable particulates, and organic vapors/acid gases).

### 4. Mitigation:

- Limiting exposure
- Source minimization: Conduct prescribed burns when conditions are best to minimize firefighters smoke exposure.
- Examples of actions.

D. **Particulates** are presently the major pollutant of concern from prescribed fire - Effects on human health and visibility.

Wood smoke particulates are relatively small.

- 70% - less than 2.5 microns
- 20% - 2.5 to 10 microns
- 10% - greater than 10 microns

#### 1. Health effects of particulates

Small size of particulates allows them to be carried deep into the lungs.

PM exposure management for firefighters

- Stay out of smoke
  - Limit Exposure - Rotate personnel out of heavy smoke areas
  - Use protective devices
2. Visibility - Wood smoke particulates also have a size range near the wave length of visible light which makes them excellent scatterers of light and, therefore, excellent reducers of visibility.
- a) Safety Aspects - Highway and airport visibilities
  - b) Welfare Aspects - Federal and State regulatory requirements to protect visibility in Class I areas (e.g., National Parks and Wilderness Areas)

V. Present Legal Requirements for Managing Smoke from Prescribed Fire

- A. The Clean Air Act (CAA) was passed by Congress in 1963 and amended in 1966, 1967, 1972, 1977, and 1990. This Act was established to protect and enhance the quality of the nation's air resources and to protect public health and welfare. Identified in this Act are standards and legal requirements that must be met by EPA, other Federal agencies, States, and private industry.

Prior to 1990, the Federal CAA did not directly address prescribed fire. With the 1990 amendments, the Clean Air Act contains a number of sections which may result in both direct and indirect regulatory control. The most important ones for you to consider are highlighted below.

1. **Section 110:** Requires States to develop State Implementation Plans (SIPs) which identify how the State will attain and maintain national ambient air quality standards and other Federal air quality regulations. The Act gave the States primary responsibility for air quality management and SIPs identify how States will carry out this responsibility.
2. **Section 118:** Requires all Federal agencies to comply with all Federal, State, and local air quality regulations.

Under the 1990 amendments, any State or local air quality agency can require a permit to conduct prescribed burns and all Federal agencies must comply.

The second part of the 1990 amendments to this section specifies that all Federal agencies are required to pay all fees or charges imposed by States or local regulatory agencies.

3. **Section 169A** provides visibility protection for mandatory Federal Class I areas. Those areas include International Parks, National Memorial Parks which exceed 5,000 acres in size, National Parks which exceed 6,000 acres in size, and Wilderness Areas which exceed 5,000 acres in size and were in existence prior to August 7, 1977.
4. **Section 190:** Requires the EPA to issue guidance on control measures for agricultural and silvicultural burning within 18 months of enactment of the amendment (1990 amendment).

B. NEPA

- An analysis of possible air quality impacts may be needed in a NEPA analysis in your fire management program:
  - raised air quality as a significant issue in scoping,
  - includes burning,
  - includes significant machinery operation in close proximity to publicly accessible areas (for example, pipe line pumps, ski areas),
  - may have any impact on air quality in a Class I air shed,
  - may have any impact on sensitive vistas or visibility,
  - is in close proximity to a non-attainment area.
  - We generally do not perform a separate NEPA analysis for each RX burn unit; rather, we write a smoke management plan.

- C. State and Local Regulations - As required by the Clean Air Act, States have to develop State Implementation Plans (SIPs). State air quality regulations may be more stringent than Federal air quality regulations. There are a number of examples where States or local

agencies have developed regulations which directly address prescribed fire. States have:

1. Restricted burning times:  
Washington/Oregon do not allow prescribed burning on weekends during the summer months - protect visibility in Class 1 areas
2. Required a reduction in total particulate emissions.
3. Developed a fee system for prescribed burning based on projected emissions (Oregon).
4. Require land managers to use a dispersion model to predict down wind particulate concentrations for each prescribed burn (Wyoming).

VI. Potential Legal Requirements for Managing Smoke From Prescribed Fire (Future Regulations)

- A. Fine Particulate Regulations: On July 31, 1987, the EPA established ambient air quality standards for particulates less than 10 microns in diameter (PM-10).

At the same time EPA established the PM-10 standards, they also proposed the development of standards for particulates less than 2.5 microns (PM-2.5). New standards for these fine particulates could severely constrain prescribed fire programs since the majority of particulates produced from this type of burning is in this size class.

- B. Visibility Requirements: As part of the Visibility Regulations, EPA requires that States consider the impacts of prescribed burning on visibility and the adequacy of smoke management programs. EPA and State visibility regulations are being developed to help meet the national visibility goal: the prevention of any future and mitigation of any existing impairment of visibility in mandatory Federal Class I areas from man-made pollution.

VII. The Need for Involvement in the Regulatory Process

- A. Fire, both wildland fire and prescribed fire, is a major source of PM-10, PM-2.5, and visibility impairment in many States.

In general, air regulatory agencies do not understand the need for prescribed fire.

- B. Unless land managers are effectively involved in the regulatory development process, the regulations which will be developed by the States to implement PM-10 standards and protect visibility may significantly reduce the use of prescribed fire as a land management tool. We must be able to defend our Smoke Management Programs as Best Available Control Measure (BACM).

#### VIII. Smoke Management - Components of a Program

- A. The major components of a Smoke Management Program include:

- Alternative to burning
- Emission reduction
- Meteorological scheduling
- Education

##### 1. Alternative to Burning - (Probably not applicable)

- a. Mechanical treatment
- b. Burying
- c. Chemical treatment
- d. Improved utilization
- e. No treatment

Key - Management objectives must be well defined before any treatment is selected. "We want to burn the vegetation" is NOT a management objective.

Also Key - Costs are not considered in determining whether or not National Ambient Air Quality Standards need to be met.

##### 2. Emission Reduction

The objective is to reduce the emission factor for particulate emissions (Range 17-180 lbs/ton of material burned). Methods will be discussed in next lesson.

### 3. Meteorological Scheduling

Prescribed fires can be set when meteorological conditions provide for the best dispersal of pollutants. "Best Dispersal" is both directing plumes away from smoke sensitive areas and obtaining maximum atmospheric diffusion.

### 4. Education - We must be able to convince the air regulatory agencies and the public that our Smoke Management programs represent Best Available Control Measures (BACM) and do work.

a. Re-emphasize interpretive programs

b. Re-emphasize good working relationships with APCOs

One day in the field is worth several days of meetings.

c. Develop media management skills.

d. Generate sound, factual data pertaining to smoke management programs by establishing effective long-term smoke management monitoring systems.